GEOPHYSICAL SURVEY AND GROUND WATER ASSESSMENT

EAST 55TH STREET AND WOODLAND AVENUE
CLEVELAND, OHIO 44104

FEBRUARY 2013

PREPARED FOR:
CUYAHOGA COUNTY LAND REUTILIZATION CORPORATION
323 W. LAKESIDE SUITE 160
CLEVELAND, OH 44113

GEOPHYSICAL SURVEY AND GROUND WATER ASSESSMENT

EAST 55TH STREET AND WOODLAND AVENUE
CLEVELAND, OHIO 44104

PREPARED BY:______________________________
JOHN A. ZAMPINO, CPG, CP 280
SENIOR PROJECT MANAGER

The Mannik & Smith Group, Inc.

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1.0 INTRODUCTION

1.1 Introduction

The Mannik & Smith Group (MSG) was retained by the Cuyahoga County Land Reutilization Corporation (CCLRC) to conduct a geophysical survey and install ground water monitoring wells on permanent parcels numbered (PPN) 12308001; 12308070-12308075; 12308030-12308035;12308002; 12308003, 12307019, and 12307022 located at East 55th Street and Woodland Avenue, Cleveland, Ohio (the Property). This assessment, funded through a United States Environmental Protection Agency (US EPA) Petroleum Assessment Grant, was a continuation of the Property's assessment which began in 2099. The Ohio Environmental Protection Agency's (Ohio EPA) Division of Environmental Response and Revitalization (DERR) provided Technical Assistance (TA) related to the installation of the ground water monitoring well network.

The geophysical survey and ground water assessment of the Property had three objectives. The first was to identify, through a geophysical survey underground storage tanks (USTs) suspected to be located along the west side of the Property and identify "fill material" and/or "building foundations" which will require removal as part of redevelopment. The second objective was to assess shallow ground water to determine if a remedy (i.e. passive indoor air vent system) would be required as part of redevelopment. The second objective also included, if necessary, (i.e. if shallow ground water is impacted above Ohio Voluntary Action Program (VAP) standards), the assessment of deep ground water to delineate the vertical extent of ground water impacts. The third objective was to evaluate soil and ground water data with respect to Ohio's VAP to determine what remedial activities are necessary based on the current redevelopment plan

In order to collect applicable field data and efficiently use available petroleum grant funds, MSG approached the assessment iteratively. The progression of work included a geophysical survey, the preparation of a Health and Safety Plan (HASP) and a Ground Water Sampling and Analysis Plan (GW SAP), collection of ground water samples from four existing monitoring wells on the Property, install shallow monitoring wells, and lastly install deep monitoring wells. The GW SAP is included as Appendix A.

1.2 Project Deviations

The Scope of Work initially called for the sampling of four existing ground water monitoring wells installed on the Property as part of an UST assessment conducted on a gasoline service station located east of the Property across East 55th Street. During the geophysical survey MSG noted that the four existing monitoring wells had been abandoned by filling with concrete. Thus the sampling and analysis of ground water from these monitoring wells was eliminated from the Scope of Work. The ground water in this area was assessed via the installation of one ground water monitoring well.

1.3 Previous Environmental Investigations

Beginning in 2009 HzW Environmental Consultants, LLC (HzW) completed an Ohio VAP Phase I Property Assessment (Phase I PA) of the Property on behalf of the Cuyahoga County's Department of Economic Development (the County). The Phase I PA concluded that twelve on-site Identified Areas (IAs) and four off-site sources or source areas existed in relation to the Property. HzW recommended that an Ohio VAP Phase II PA be conducted to assess on- and off-Property concerns.

During July 2009 HzW conducted an assessment of soils located within each on Property IA. This assessment consisted of forty-nine soil borings and the submittal of sixty-four soil samples for analysis. Soil data was evaluated against Ohio VAP generic direct contact soil standards (GDCSS) for commercial/industrial (C/I) land use, GDCSS for construction and excavation activities (C/EA), leach based soil values (LBSVs), and site specific soil partitioning values (SPVs). The Phase II PA identified volatile and semi-volatile organic compounds that exceeded one or both of Ohio's VAP GDCSS for commercial/industrial land use or LBSV/SPVs. HzW recommended that monitoring wells be installed to assess ground water on-site, determine ground water flow direction, and evaluate off-site sources or source areas.

2.0 FIELD PROCEDURES

2.1 Geophysical Survey

The geophysical survey conducted on the Property utilized a GEM-300 ElectoMagnetic (GEM-300) conductivity profiling instrument and targeted ground-penetrating radar (GPR) to non-destructively scan the subsurface and locate and map potential fill areas and buried targets. The GEM-300 makes electrical conductivity and metallic sensitive readings measurements whereas GPR operates by transmitting and receiving microwave electromagnetic impulses. Both methods are used for soil and fill mapping and characterization, locating USTs, metal target exploration, and buried structure and utility pipe mapping. A copy of Grumman's report is included in Appendix B.

2.2 Groundwater Monitoring Well Installation and Development

Each 1-inch diameter monitoring well was installed using a Model 6600 truck-mounted Geoprobe® using 4.25-inch inner diameter (ID), 6.25-inch outer diameter (OD) hollow stem augers. Well casings consisted of 1-inch polyvinylchloride (PVC) riser flush threaded with 10-foot sections of 0.01-inch slot PVC screen. The annular space around the screen of each well was pre-packed with washed medium-grained sand. The sand pack continued above the top of the screened interval in each well a minimum of two (2) feet. A two (2) foot thick hydrated bentonite pellet seal was installed above the sand pack, and the remaining annular space was filled with a cement grout. All monitoring wells were completed flush with existing grade for low visibility to limit vandalism. Monitoring well diagrams included in included in Appendix C.

Upon installation, all ground water monitoring wells were developed in accordance with the Ohio EPA's Technical Guidance Manual for Hydrogeologic Investigations and Ground Water Monitoring (TGM). As part of development, field personnel first measured the depth to static water level using a SINCO or Solinst® water level indicator. The static water level and overall well depth were used to calculate the volume of ground water in each well casing. Using a peristaltic pump MSG personnel removed four well volumes from each monitoring well. During purging field personnel measured temperature, pH, conductivity, turbidity, and dissolved oxygen until these parameters stabilized. All purge waters were transferred to labeled 55-gallon drums for temporary storage. Ultimately, all purge waters associated with the development of ground water monitoring devices will be disposed of at a licensed disposal facility. Similarly, all soils generated during installation of wells were removed from the Property. Well development information is included in Appendix D.

2.3 Groundwater Sample Collection

Following purging, the same peristaltic pump used to develop each well was used to collect a ground water sample. During sample collection, the pump tubing was lowered slowly into the monitoring well to limit agitation and aeration of the sample. The tubing did not to contact the ground or other surfaces during sampling. All ground water samples were placed in labeled laboratory supplied sample containers and then placed in an ice chest for preservation in the field. MSG transported the ground water samples under proper chain-of-custody to the laboratory for analysis of volatile organic compounds (VOCs), polynuclear aromatic hydrocarbons (PAHs), lead, chromium, or arsenic. Sampling personnel wore disposable vinyl gloves throughout the sampling process. Any non-disposable ground water sampling equipment (such as the water level indicator) was decontaminated between sampling locations using an ammonium-based cleaning solution, and triple rinsing with distilled water.

2.4 Quality Assurance/Quality Control

Quality assurance/quality control (QA/QC) was achieved through the collection of a field blank, duplicate, equipment blank, and trip blank as outlined in the GW SAP

3.0 FINDINGS

3.1 Geophysical Survey Results

In general, the EM contour diagrams show broad regions of highly conductive fill that appear to include scattered metallic structures and debris. Specific regions with anomalous strong EM conductivity responses include the northeast sector along E. 55th Street; northeast sector along Woodland Avenue; southeast sector along E. 55th Street; west-central sector between E. 51st and E. 53rd Street; the northwest parcel; and the east and west sides of the single on-Property building. The EM conductivity responses in these locations are believed to indicate zones of highly conductive fill including rubble, general refuse and demolition debris with miscellaneous metallic content, and/or industrial fill such as slag, foundry sand, cinders, fill with disseminated metal particles, and/or materials with elevated salt content that are located in former excavations, or former basements. Extremely strong EM conductivity responses are believed to be caused by an UST or a reinforced concrete structure such as a more deeply buried concrete slab, ramp, basement floor, or subgrade vault.

The GPR records indicate broad regions of deeper, more chaotic GPR reflections throughout the Property. The most prominent and laterally extensive chaotic GPR responses occur in the northern half of the Property along E. 55th Street. In general, the chaotic GPR reflections indicate regions of fill spread across the Property. Regions with shallow to moderate depth chaotic GPR reflections typically indicate a veneer of demolition debris that may include bricks, concrete fragments, and mortar. Further invasive exploration, such as soil coring or test pit excavations, would be required to document the actual cause of the anomalous EM in-phase responses at these locations.

3.2 Groundwater Analytical Results

Ground water data was compared against Ohio VAP Unrestricted Potable Use Standards (UPUS). The volatile organic compound (VOC) toluene was detected in monitoring wells MW-02 and MW-06 at 62.2 and 73.4 micrograms per liter (ug/l), respectively. Both concentrations of toluene were below the UPUS of 1,000 ug/l. Table 1 provides a summary of compounds detected in ground water samples submitted for analysis. Table 2 provides a summary of compounds detected in QA/QC samples submitted for analysis. QA/QC sample designated EB122812, an equipment blank, contained a 5.3 ug/l of chloroform. Chloroform was not detected in any of the ground water samples and is commonly considered an artifact of laboratory analysis. Laboratory data reports are provided in Appendix E.

To determine ground water flow direction the static water level of each well was subtracted from each wells top-of-casing elevation. Table 3 provides a summary of static water level data. Figure 3 presents a piezometric surface map depicting ground water flowing in southwesterly direction.

Table 1 Ground Water Analytical Data Summary

Maingate Property - East 55th Street and Woodland, Cleveland, Ohio

Parameter	UPUS Standard	Units	MW-01	MW-02	MW-03	MW-04	MW-05	MW-06
Volatile Organic Compounds (VOCs)								
Toluene	1,000	ug/L	ND	62.2	NA	NA	ND	73.4
Chloroform	40	ug/L	ND	ND	NA	NA	ND	NA
Polynuclear Aromatic Hydrocarbons (PAHs)								
All PAHs	--	ug/L	NA	NA	ND	ND	ND	ND
Metals								
Arsenic	10	ug/L	NA	NA	NA	NA	NA	ND
Lead	15	ug/L	NA	NA	ND	NA	NA	NA
Chromium	100	ug/L	NA	NA	ND	NA	NA	NA

Table 2 Quality Assurance/Quality Control Data Summary

Maingate Property - East 55th Street and Woodland, Cleveland, Ohio

Parameter	UPUS Standard	Units	Trip Blank*	FB 112812*	EB 112812*	DUP 112812*
Volatile Organic Compounds (VOCs)						
Toluene	1,000	ug/L	ND	NA	ND	NA
Chloroform	40	ug/L	ND	NA	5.3	NA
Polynuclear Aromatic Hydrocarbons (PAHs)						
All PAHs	--	ug/L	NA	ND	NA	NA
Metals						
Arsenic	10	ug/L	NA	NA	NA	NA
Lead	15	ug/L	NA	NA	NA	ND
Chromium	100	ug/L	NA	NA	NA	NA

Table 3 Ground Water Gauging Data

Maingate Property - East 55th Street and Woodland, Cleveland, Ohio

	Date	Well Designation					
Well ID		MW-01	MW-02	MW-03	MW-04	MW-05	MW-06
TOC		498.48	498.51	499.96	498.58	497.36	500.09
Total Depth		21.25	25.25	25.08	23.30	24.67	25.08
SWL	November-12	15.49	15.23	17.05	15.75	14.73	17.35
SWL	January-13	15.73	15.56	17.44	16.14	15.15	17.71
Med SWL		15.61	15.40	17.25	15.95	14.94	17.53
Med GW Elev		482.87	483.12	482.72	482.64	482.42	482.56
Min		15.49	15.23	17.05	15.75	14.73	17.35
Max		15.73	15.56	17.44	16.14	15.15	17.71
Std Dev		0.17	0.23	0.28	0.28	0.30	0.25

TOC - Top of Casing Elevation

SWL - Static Water Level

ND – Compound not detected

NA – Compound not analyzed

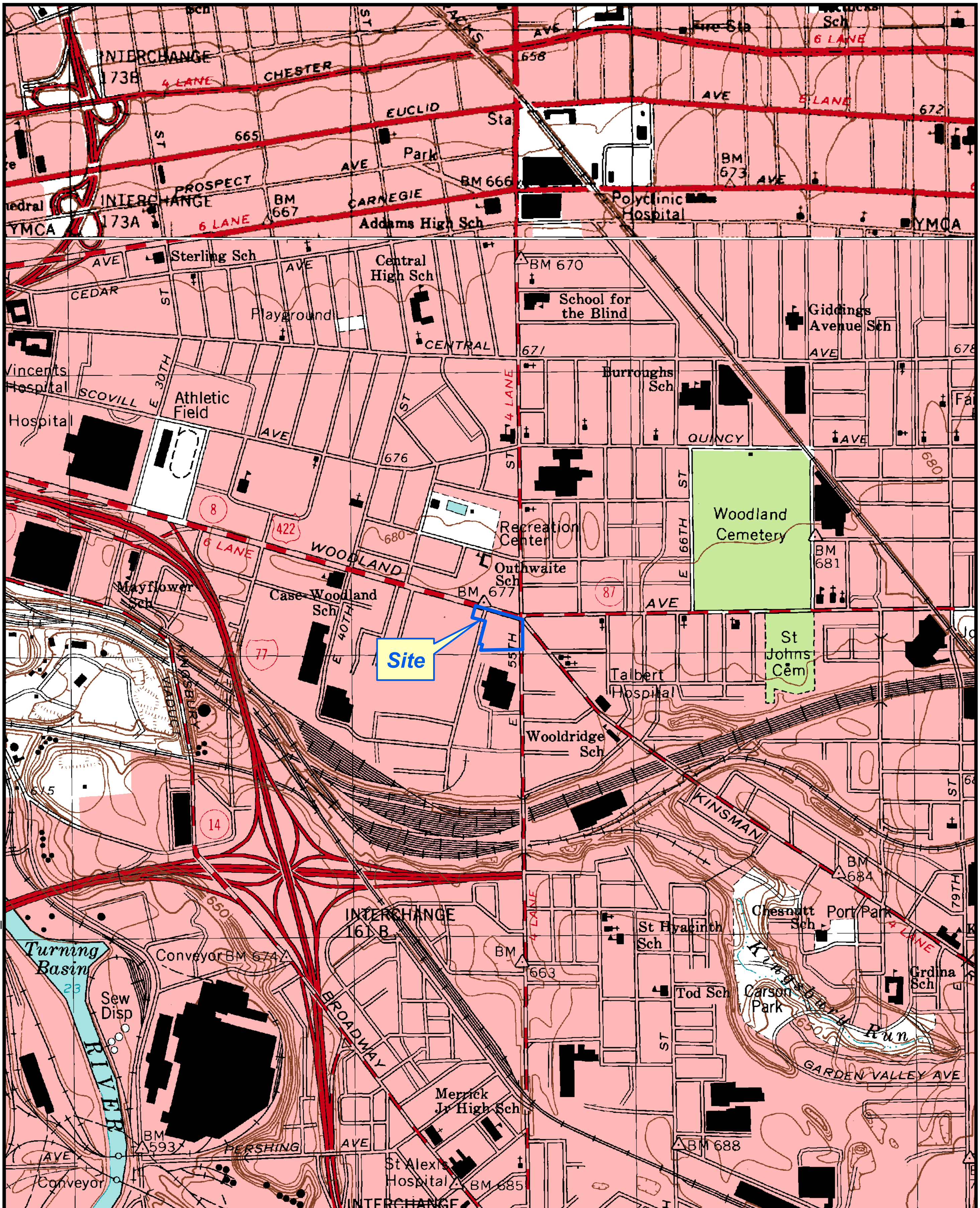
4.0 CONCLUSIONS

Based upon the information collected during this assessment, MSG concludes the following:

1. The geophysical survey identified seven locations containing demolition debris and metal objects, two building foundations, and one suspected UST.
2. Shallow ground water sampled from monitoring wells MW-01, MW-02, MW-03, MW-04, MW-05, and MW-06 do not contain compounds in excess of Ohio VAP UPUS and therefore “deep” ground water does not need to be assessed.
3. Ground water flows in a southwesterly direction across the Property.
4. On-site IAs have not as well as off-site sources or source areas have not impacted ground water beneath the Property.

5.0 RECOMMENDATIONS

Prepare a Remedial Action Plan that includes the removal of soil impacted above Ohio VAP applicable standards as well as removing existing construction and demolition debris, concrete foundations, and suspected UST.



Environmental Site Assessment Phase II

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MAUMEE ♦ CLEVELAND ♦ MONROE ♦ CANTON

Figure 1: Site Location
E. 55th St. & Woodland Ave.
Cleveland, Ohio

Notes
USGS Quadrangles, 7.5' Series Topographic
Cleveland North, Cuyahoga Co., OH 1994
Cleveland South, Cuyahoga Co., OH 1994

Feet
0 1,000 2,000

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GRAPHIC SCALE

0' 50' 100'

LEGEND

- (1) IDENTIFIED AREA #1 - FORMER PAINTS & OIL STRUCTURE
- (2) IDENTIFIED AREA #1 - FORMER PAINTS, OIL & PRINT SHOP
- (3) IDENTIFIED AREA #1 - SCRAP METAL STORAGE YARD
- (4) IDENTIFIED AREA #1 - FORMER WALLPAPER & PAINTS STRUCTURE
- (5) IDENTIFIED AREA #1 - FORMER PRINT SHOP
- (6) IDENTIFIED AREA #1 - FORMER DRY CLEANER
- (7) IDENTIFIED AREA #7 - FORMER HARDWARE, OILS, VARNISH & TIN SHOP STRUCTURE
- (8) IDENTIFIED AREA #8 - FORMER PAINT SHOP
- (9) IDENTIFIED AREA #9 - FORMER TIN SHOP
- (10) IDENTIFIED AREA #10 - FORMER GASOLINE FILLING STATION
- (11) IDENTIFIED AREA #11 - FORMER DRY CLEANER
- (12) IDENTIFIED AREA #12 - FORMER PRINT SHOP
- (13) IDENTIFIED AREA #13 - FORMER SUNOCO GASOLINE FILLING STATION
- (14) IDENTIFIED AREA #14 - FORMER 8,000-GALLON FUEL LIST
- (15) IDENTIFIED AREA #15 - HANINI MARATHON OIL GASOLINE FILLING STATION
- (16) IDENTIFIED AREA #16 - FORMER STATNDARD OIL GASOLINE FILLING STATION
- (17) IDENTIFIED AREA #17 - SHELL GASOLINE FILLING STATION
- PROPERTY LINE
- MONITORING WELL LOCATION

EAST 55TH ST. AND WOODLAND AVENUE

ENVIRONMENTAL SITE ASSESSMENT PHASE II

FIGURE 2: SITE LAYOUT AND BORING LOCATION PLAN

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23225 Mercantile Road Beachwood, Ohio 44122
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Civil Engineering, Surveying and Environmental Consulting

01/16/2013

W:\Projects\Projects A-E\C3210002\CAD\C3210002\FIGURES\C3210002.FIG2.SITE_LAYOUT.AWS.dwg

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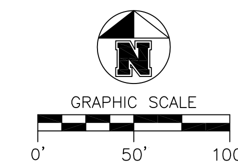

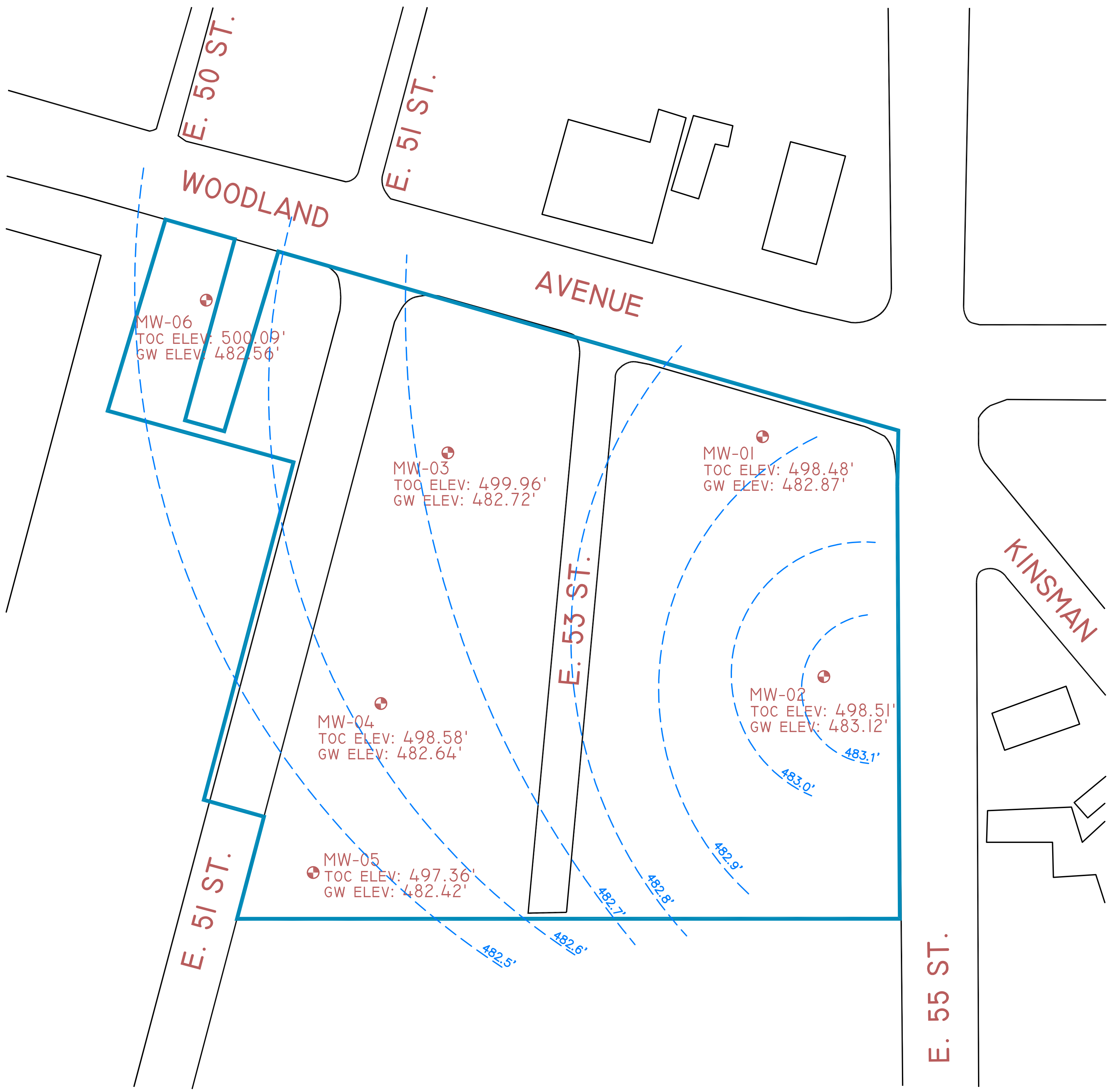

LEGEND

- PROPERTY LINE
- MONITORING WELL LOCATION
- GROUNDWATER CONTOUR

NOTES

1. TOP OF CASING (TOC) ELEVATIONS ARE RELATIVE TO SITE.
2. GROUNDWATER (GW) ELEVATIONS ARE BASED ON NOVEMBER 28, 2012 AND JANUARY 14, 2013 GAUGING EVENTS.

ENVIRONMENTAL SITE ASSESSMENT PHASE II

EAST 55TH ST. AND WOODLAND AVENUE

FIGURE 3: SITE GROUNDWATER CONTOUR MAP

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W:\Projects\Projects A-E\C3210002\CAD\C3210002\FIGURES\C3210002.FIG3.GW CONTOUR MAP.AWS.dwg

APPENDIX A:

GROUND WATER SAMPLING AND ANALYSIS PLAN

GROUND WATER – SAMPLING AND ANALYSIS PLAN

EAST 55TH ST. AND WOODLAND AVE
CLEVELAND, OH 44104

SEPTEMBER 2012

PREPARED FOR:
CUYAHOGA COUNTY LAND REUTILIZATION CORPORATION
323 W. LAKESIDE SUITE 160
CLEVELAND, OH 44113

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1.0 INTRODUCTION

The Cuyahoga County Land Reutilization Corporation (the County) has retained The Mannik & Smith Group, Inc. (MSG) as a consultant to assist the County in completing a Ground Water Assessment (GWA) of vacant properties located at East 55th Street and Woodland Avenue, Cleveland, Ohio (the Property). The scope of the GWA is based on the findings of an Ohio Voluntary Action Program (Ohio VAP) Phase I Property Assessment (PA) and an Ohio VAP Phase II PA (soil only), which were completed by HzW Environmental Consultants, Inc. (HzW). MSG will utilize its skills and expertise to complete the GWA and prepare the final report. The final report will include recommendations regarding further assessment, remedial actions, and a cost estimate. This Ground Water Sampling and Analysis Plan (SAP) presents the methods that will be used during monitoring well installation and ground water sample collection. This Ground Water SAP has been prepared for the intended use of MSG personnel only. Compliance with this Ground Water SAP will ensure that representative ground water samples will be obtained from monitoring well sampling events.

2.0 SITE DESCRIPTION

The Property is situated south Woodland Avenue between East 50th Street and East 55th Street in the City of Cleveland, Cuyahoga County, Ohio. A Site Location Map is included as Figure 1. The Property encompasses portions of two (2) rights-of-way (East 51st Street and East 53rd Street) and eighteen (18) parcels totaling 4.46 acres. Currently, the Property is vacant with minimal vegetation. The VAP Phase I PA concluded 16 identified areas (IAs) exist in connection with the Property and include:

1. Former Paint & Oils Structure;
2. Former Paints, Oils & Print Store;
3. Former Scrap Metal Storage Yard;
4. Former Hardware, Wallpaper & Paints Structure;
5. Former Print Shop;
6. Former Dry Cleaner;
7. Former Hardware, Oils, Varnish & Tin Shop Structure;
8. Former Paint Shop;
9. Former Tin Shop;
10. Former Gasoline Filling Station;
11. Former Dry Cleaner; and
12. Former Print Shop
13. Former Sunoco Gasoline Filling Station
14. Former 8,000 gallon fuel oil UST
15. Former Standard Oil Gasoline Filling Station
16. Former Shell Gasoline Filling Station

Figure 2 is a site map depicting each IA.

3.0 PREVIOUS DATA COLLECTION

Prior assessments of the Property included an Ohio VAP Phase I PA and a partial Ohio VAP Phase II PA (soil only). Based on the findings of the Phase I PA conducted by HzW, the Property warranted a complete Phase II PA. However due to budget constraints, the Phase II PA consisted of the installation of 49 soil borings and the submittal of 64 soil samples for analysis. The Phase II PA identified the volatile organic compounds (VOCs) chlorobenzene, 1,1-dichloroethane, cis-1,2-dichloroethene, tetrachloroethene, and total xylenes that exceeded Ohio VAP generic direct contact soil standards or leach based soil values/soil partition values. The Phase II PA also identified benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene, benzo(ghi)pyrene, benzo(k)flouranthene, chrysene, flourene, naphthalene, or pyrene in excess of LBSVs/SPVs. Lastly, the metals arsenic, chromium, and lead exceeded LBSVs/SPVs. The Phase II PA concluded that monitoring wells be installed to assess ground water on-site, to determine ground water flow direction and evaluate off-site environmental concerns.

4.0 PROBLEM DEFINITION

Understanding that the soil phase of the Phase II PA identified certain compounds in excess of LBSVs/SPVs and that there exists several off-site sources or source areas, consisting of gasoline stations, it is necessary to assess ground water beneath the Property. To accomplish this Maingate Cleveland (Maingate) prepared a brownfield assessment application to use United States Environmental Protection Agency (USEPA) Petroleum Assessment Grant funds to iteratively assess ground water. In addition, the grant funds will be used to conduct a geophysical survey (not conducted during the prior Phase II PA), prepare a multiple chemical adjustment, determine an appropriate remedy, and prepare a remedial cost estimate. Ground water sampling and analysis will be conducted to allow for comparison to standards and/or values presented in Ohio's VAP. Appendix A includes Ohio VAP's ground water standards and/or values used for data evaluation.

5.0 GROUND WATER ASSESSMENT AND SAMPLE NETWORK

In order to collect applicable field data and efficiently use available petroleum grant funds, MSG will approach this project in an iterative manner. In addition, following the completion of each iteration, MSG will confer with the Ohio Environmental Protection Agency (Ohio EPA), United States EPA (USEPA), and the County to discuss the findings of each iteration and alternatives applicable to the next iteration. Currently four monitoring wells are located on the Property and are part of a ground water investigation conducted at the Shell Gasoline Station located east of the Property across East 55th Street. No other monitoring wells are located on the Property. MSG anticipates this project will proceed as follows:

- Conduct geophysical survey. (This task is independent of all other proposed tasks.)
- Prepare the Ground Water SAP and health and safety plans.)
- Submit the Ground Water SAP to the USEPA for review and approval.
- Sample four existing monitoring wells (MW-12, MW-13, MW-14, and MW-15).
  - If shallow ground water does not exceed unrestricted potable use standards (UPUS) then eliminate one shallow (MW-02) and one deep ground water monitoring well (MW-07 Deep).
  - If ground water from the existing monitoring wells exceeds UPUS, install one shallow well (MW-02) and one deep ground water monitoring well (MW-07 Deep) to delineate the vertical and horizontal limits of ground water impacts adjacent to the four existing monitoring wells (MW-12, MW-13, MW-14, and MW-15).
- Install shallow monitoring wells in the vicinity of the bank, restaurant, auto parts store, retail store and the northeast corner of the property (MW-03, MW-04, MW-05, MW-06 and MW-01).
  - If shallow ground water does not exceed UPUS then eliminate two deep monitoring wells (MW-07 and MW-08), one geologic bore and one, two inch monitoring well (MW-09).
  - If shallow ground water exceeds UPUS then install no more than two deep monitoring wells (MW-07 and MW-08).
- If deep ground water exceeds UPUS and it is necessary to classify ground water and collect geotechnical parameters install a two-inch diameter deep well (MW-09) at a down gradient location in order to prepare a demonstration that lower ground water zone meets UPUS.
- Prepare letter report that evaluates soil and ground water data with respect to Ohio's VAP and identify applicable remedies.

Ground water monitoring well installation will be conducted using hollow-stem augering techniques. Hollow-stem augers will be advanced using a Geoprobe or rotary drill rig. Monitoring wells will be installed at locations that will allow the direction of ground water to be determined and in or adjacent to areas that exhibit contamination based on the prior soil sampling. Monitoring wells will consist of 1-inch polyvinylchloride (PVC) casing flush treaded to 0.01 slot PVC screen. Wells will be completed according to standard specifications as depicted in Appendix B. Monitoring well locations are identified on Figure 3: Proposed Monitoring Well Location Map.

Table 1 is a Site Sampling Plan that indicates specific sampling matrices and testing parameters for ground water samples to be collected at the Property. Quality Assurance and Quality Control (QA/QC) sampling for ground water will be conducted as indicated in the Quality Assurance Project Plan (QAPP). Field QA/QC will be conducted as indicated in Table 2.

Table 1: Site Sampling Plan[1]

Monitoring Well ID	Sample ID	Matrix	Parameters	Sampling Rationale
MW-12 (Existing)	MW-12-Date	Ground Water	VOCs	Prior off-site release information
MW-13 (Existing)	MW-13-Date	Ground Water	VOCs	Prior off-site release information
MW-14 (Existing)	MW-14-Date	Ground Water	VOCs	Prior off-site release information
MW-15 (Existing)	MW-15-Date	Ground Water	VOCs	Prior off-site release information
MW-01	MW-01-Date	Ground Water	VOCs	Prior off-site release information
MW-02	MW-02-Date	Ground Water	VOCs	Prior off-site release information
MW-03	MW-03-Date	Ground Water	PAH, lead, chromium	LBSV/SPV exceeded
MW-04	MW-04-Date	Ground Water	PAH	LBSV/SPV exceeded
MW-05	MW-05-Date	Ground Water	PAH	LBSV/SPV exceeded
MW-06	MW-06-Date	Ground Water	VOC, PAH, arsenic	LBSV/SPV exceeded
MW-07 (Deep)	MW-07-Date	Ground Water	VOCs, PAHs, arsenic, lead, and/or chromium	If unrestricted potable use standards are exceeded
MW-08 (Deep/Geologic Bore)	MW-08-Date	Ground Water	PAH, lead, and/or chromium	If unrestricted potable use standards are exceeded
MW-09 (2.0 inch well)	MW-09-Date	Ground Water	None	Characterize Ground Water

Table 2: Ground Water QA/QC Sample Summary

QA/QC Sample Type	Frequency of Sample/Analysis	Description
Decon Blanks (Equipment Blank)	1 per 20 investigative samples (per sample matrix)	Distilled water placed into contact with sampling equipment. Used to assess quality of data from field sampling and decontamination procedures.
Trip Blanks	1 per sample cooler/VOC analysis	Laboratory prepared organic-free blank to assess potential contamination during sample container shipment and storage.
Bottle Blanks (Field Blank)	1 per 20 investigative samples (per sample matrix)	Laboratory-shipped bottles used for sampling. A bottle will be selected at random and sent to laboratory for analysis.
Duplicate Samples	1 per 20 investigative samples (per sample matrix)	Duplicate sample collected by the same methods and at the same time as original sample. Used to verify sampling and analytical reproducibility.

6.0 PERSONNEL

Personnel who will perform project management and sampling by this plan will be familiar with this Ground Water SAP and the Quality Assessment Program Plan (QAPP). These individuals and their titles are listed below.

Senior Project Manager	John Zampino, CP, CPG
QA/QC Officer	Doug Perisutti, PE, CPG
MSG Field Personnel	Anthony Schulte, EI

7.0 PROJECT SCHEDULE

An approximate schedule for implementation of this Ground Water SAP is included in Table 3. Please note that this schedule is an approximation and will depend upon receipt of the approved Ground Water SAP from the United States Environmental Protection Agency (USEPA).

Table 3: Ground Water Sampling Schedule

Task	Date
Prepare Ground Water SAP and HASP (Health and Safety Plan)	September, 2012
Conduct Geophysical Survey	September, 2012
Sample existing Monitoring Wells	September, 2012
Install Shallow Ground Water Monitoring Wells	October, 2012
Install Deep Ground Water Monitoring Wells (if necessary)	October, 2012
Phase II Report Preparation	November, 2012

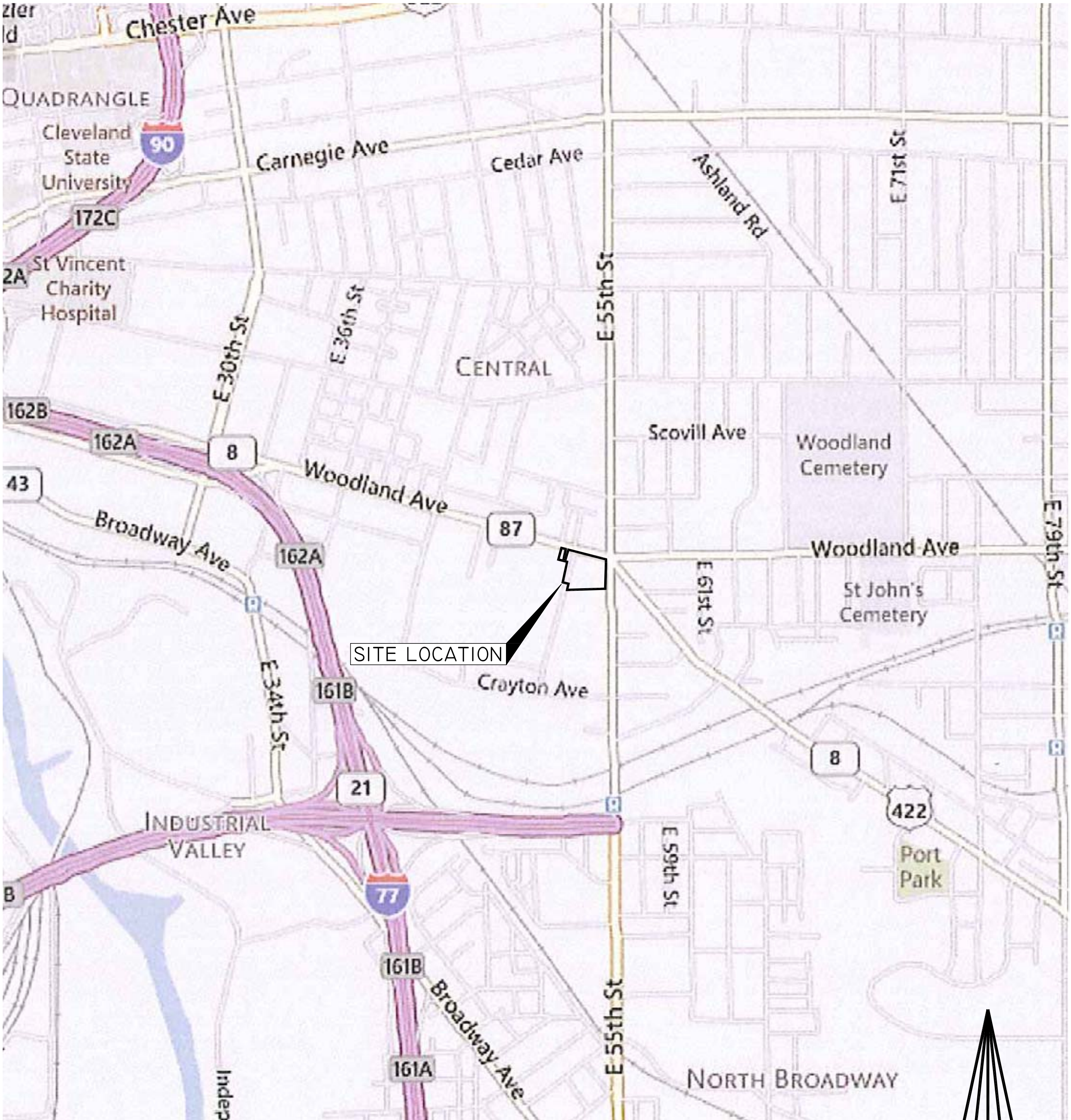
8.0 GROUND WATER SAMPLE SHIPMENT

All samples will be placed in media provided by an Ohio VAP certified laboratory. Table 4 identifies each parameter, container, preservative, and holding time for specific ground water samples. All samples will be submitted to the VAP certified laboratory in accordance with methods discussed in the QAPP.

Table 4: Ground Water Sampling Media

Matrix	Parameter	Container	Preservative	Hold Time
Ground Water	VOCs	(3) 40-mL glass vial	HCL – Cool 4˚C	14 Days
	SVOCs	(1) 1-Liter glass	None – Cool 4˚C	7 Days Extraction 40 Day Analysis
	Metals	(1) 500-mL plastic	HNO_3 – Cool 4˚C	6 Months

FIGURE 1:
SITE LOCATION MAP



SCALE IN FEET

1000 500 0 1000 2000

1"=1000'

N

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Civil Engineering, Surveying and Environmental Consulting

SITE LOCATION MAP

WOODLAND AVENUE, CLEVELAND, OHIO

FIGURE 1

OF 3

C3210002

FIGURE 2:
IDENTIFIED AREA MAP

LEGEND

1	IDENTIFIED AREA #1 - FORMER PAINTS & OIL STRUCTURE
2	IDENTIFIED AREA #1 - FORMER PAINTS, OIL & PRINT SHOP
3	IDENTIFIED AREA #1 - SCRAP METAL STORAGE YARD
4	IDENTIFIED AREA #1 - FORMER WALLPAPER & PAINTS STRUCTURE
5	IDENTIFIED AREA #1 - FORMER PRINT SHOP
6	IDENTIFIED AREA #1 - FORMER DRY CLEANER
7	IDENTIFIED AREA #7 - FORMER HARDWARE, OILS, VARNISH & TIN SHOP STRUCTURE
8	IDENTIFIED AREA #8 - FORMER PAINT SHOP
9	IDENTIFIED AREA #9 - FORMER TIN SHOP
10	IDENTIFIED AREA #10 - FORMER GASOLINE FILLING STATION
11	IDENTIFIED AREA #11 - FORMER DRY CLEANER
12	IDENTIFIED AREA #12 - FORMER PRINT SHOP
13	IDENTIFIED AREA #13 - FORMER SUNOCO GASOLINE FILLING STATION
14	IDENTIFIED AREA #14 - FORMER 8,000-GALLON FUEL LIST
15	IDENTIFIED AREA #15 - HANINI MARATHON OIL GASOLINE FILLING STATION
16	IDENTIFIED AREA #16 - FORMER STATNDARD OIL GASOLINE FILLING STATION
17	IDENTIFIED AREA #17 - SHELL GASOLINE FILLING STATION
	PROPERTY LINE

The Mannik & Smith Group, Inc.
23225 Mercantile Road
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Tel (216) 378-1490
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Civil Engineering, Surveying and Environmental Consulting

JOB NO. C3210002

WOODLAND AVENUE

FIGURE 2
IDENTIFIED AREAS

2 / 3

FIGURE 3:
PROPOSED MONITORING WELL LOCATION MAP

LEGEND

1 IDENTIFIED AREA #1 - FORMER PAINTS & OIL STRUCTURE
2 IDENTIFIED AREA #1 - FORMER PAINTS, OIL & PRINT SHOP
3 IDENTIFIED AREA #1 - SCRAP METAL STORAGE YARD
4 IDENTIFIED AREA #1 - FORMER WALLPAPER & PAINTS STRUCTURE
5 IDENTIFIED AREA #1 - FORMER PRINT SHOP
6 IDENTIFIED AREA #1 - FORMER DRY CLEANER
7 IDENTIFIED AREA #7 - FORMER HARDWARE, OILS, VARNISH & TIN SHOP STRUCTURE
8 IDENTIFIED AREA #8 - FORMER PAINT SHOP
9 IDENTIFIED AREA #9 - FORMER TIN SHOP
10 IDENTIFIED AREA #10 - FORMER GASOLINE FILLING STATION
11 IDENTIFIED AREA #11 - FORMER DRY CLEANER
12 IDENTIFIED AREA #12 - FORMER PRINT SHOP
13 IDENTIFIED AREA #13 - FORMER SUNOCO GASOLINE FILLING STATION
14 IDENTIFIED AREA #14 - FORMER 8,000-GALLON FUEL LIST
15 IDENTIFIED AREA #15 - HANINI MARATHON OIL GASOLINE FILLING STATION
16 IDENTIFIED AREA #16 - FORMER STATNDARD OIL GASOLINE FILLING STATION
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WOODLAND AVENUE

FIGURE 3
PROPOSED
MONITORING WELL
LOCATIONS

3 / 3

S:\Projects\Projects A-E\A2610001\CAD\A2610001-C3D\DWG\C3210002-C3D Woodland Ave. Exhibit.dwg, FIG 3 MONITORING WELL LOC, 9/4/2012 10:43:12 AM, RZIMMERMAN, Adobe PDF.pc3

APPENDIX A:
Ohio Voluntary Action Program Standards and Values

Ohio VAP Unrestricted Potable Use Standards
Volatile Organic Chemicals (ug/L)

Benzene	5	Acetone	14,000
Carbon Tetrachloride	5	Carbon Disulfide	1,400
Chlorobenzene	100	Chloroethane	550
Dichloroethane, 1,2-	5	Chloroform	40
Dichloroethene, 1,1-	7	Dibromochloromethane	19
Dichloroethene, *cis* -1,2-	70	Dichlorodifluoromethane	2,100
Dichloroethene, *trans* -1,2-	100	Dichloroethane, 1,1-	250
Dichloropropane, 1,2 -	5	Dichloropropene, 1,3 -	16
Ethylbenzene	700	Dioxane, 1,4-	140
Methyl *tert* -Butyl Ether (MTBE)	40	Ethyl Ether	3,200
Methylene Chloride	5	Formaldehyde	3,200
Styrene	100	Formic acid	32,000
Tetrachloroethene	5	Hexane, n-	910
Toluene	1,000	Isobutyl Alcohol	4,700
Trichloroethane, 1,1,1-	200	Methanol	7,900
Trichloroethane, 1,1,2-	5	Methyl Ethyl Ketone (MEK)	8,900
Trichloroethene	5	Methyl Isobutyl Ketone (MIBK)	1,200
Vinyl Chloride	2	Tetrachloroethane , 1,1,1,2-	56
Xylenes, Total	10,000	Tetrachloroethane, 1,1,2,2-	7
		Trichlorofluoromethane	3,800

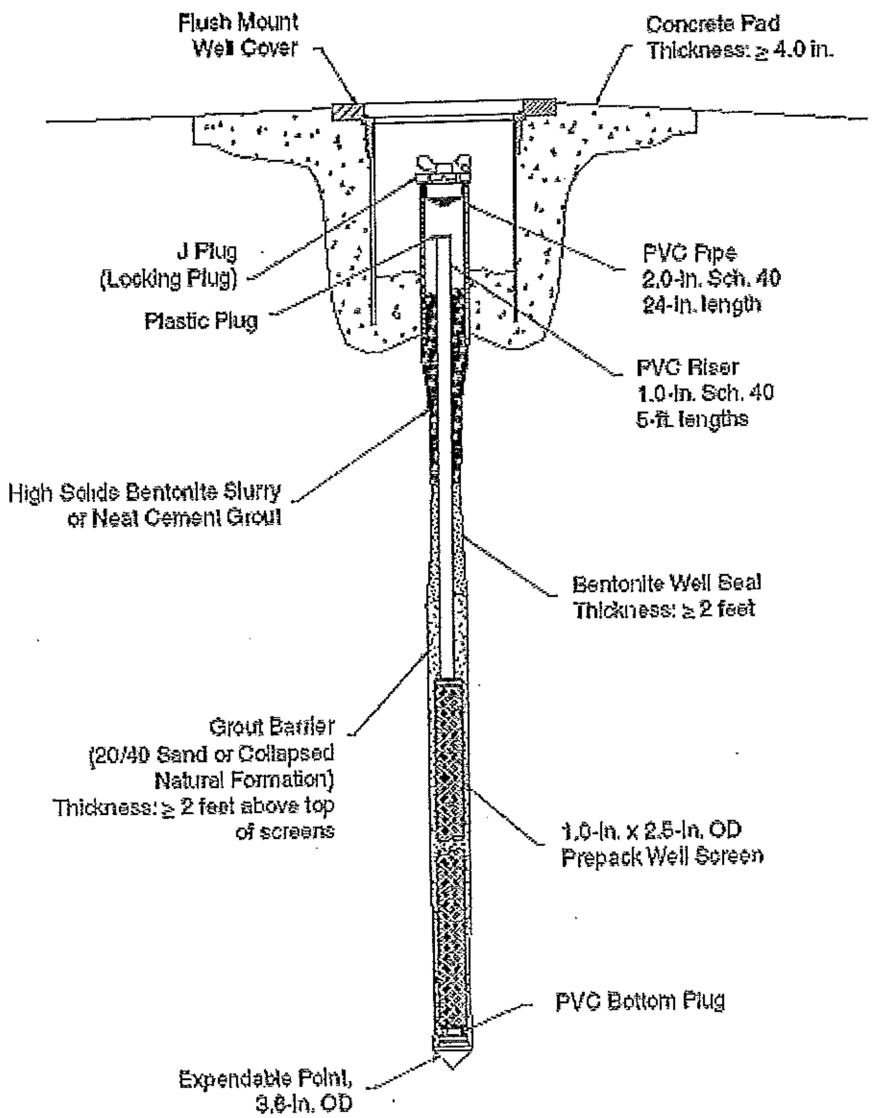
Ohio VAP Unrestricted Potable Use Standards
Semi-Volatile Organic Chemicals and Pesticides (ug/L)

Alachlor	2	Acenaphthene	950
Atrazine	3	Acetophenone	1,600
Benzo(a)pyrene	0.2	Aniline	110
Bis (2-ethylhexyl) Phthalate	6	Anthracene	4,700
Carbofuran	40	Benzo(a)anthracene	0.63
Chlordane	2	Benzo(b)fluoranthene	0.46
Dalapon	200	Benzo(k)fluoranthene	22
Dichlorobenzene, 1,2- (o)	600	Butyl Benzyl Phthalate	110
Dichlorobenzene, 1,4- (p)	75	Carbazole	79
Dichlorophenoxyacetic acid, 2,4-	70	Chrysene	63
Di(2-ethylhexyl)adipate	400	Dichlorodiphenyldichloroethane (DDD)	3.5
Dibromochloropropane (DBCP)	0.2	Dichlorodiphenyldichloroethene (DDE)	2.6
Dinoseb	7	Dichlorodiphenyltrichloroethane (DDT)	2
Dioxin (2,3,7,8-TCDD)	0.00003	Diethyl Phthalate	13,000
Diquat	20	Dimethylphenol, 2,4-	310
Endothall	100	Di-*n* -butyl Phthalate	1,500
Endrin	2	Ethylene Glycol	32,000
Ethylene Dibromide (EDB)	0.05	Fluoranthene	420
Glyphosate	700	Fluorene	630
Heptachlor	0.4	Hexachloroethane	15
Heptachlor Epoxide	0.2	Indeno(1,2,3-c,d)pyrene	0.34
Hexachlorobenzene	1	Isophorone	1,700
Hexachlorocyclopentadiene	50	Isopropylbenzene (Cumene)	1,400
Lindane	0.2	m-cresol	790
Methoxychlor	40	Methylnaphthalene, 1-	1,100
Oxamyl (Vydate)	200	Naphthalene	67
Pentachlorophenol	1	Nitrosodiphenylamine, *n* -	300
Picloram	500	o-cresol	790
Polychlorinated Biphenyls	0.5	Octyl Phthalate, di-*n* -	630
Silvex (2,4,5 TP)	50	p-cresol	79
Simazine	4	Phenol	4,700
Toxaphene	3	Pyrene	470
Trichlorobenzene, 1,2,4-	70	Pyridine	16
Trihalomethanes (THMs)		Trichlorophenol, 2,4,5-	1,600
Trihalomethanes, Total	80	Trichlorophenol, 2,4,6-	120
		Trimethylbenzene, 1,2,4-	140
		Trimethylbenzene, 1,3,5-	140
		Trinitrobenzene, 1,3,5- (s)	470
		Vinyl Acetate	4,300

Ohio VAP Unrestricted Potable Use Standards
Inorganic Compounds (ug/L)

Antimony	6	Cobalt	320
Arsenic, Inorganic	10	Nickel (Soluble Salts)	320
Asbestos	7*	Silver	79
Barium and Compounds	2,000	Vanadium	130
Beryllium and Compounds	4	Zinc and Compounds	4,700
Cadmium	5		
Chromium, Total	100		
Cyanide, Free	200		
Fluorine (soluble fluoride)	4,000		
Lead	15		
Mercury	2		
Selenium and Compounds	50		
Thallium	2		

APPENDIX B:
WELL CONSTRUCTION DIAGRAM


Flush Mount
Well Cover
Concrete Pad
Thickness: ≥ 4.0 in.
J Plug
(Locking Plug)
Plastic Plug
PVC Pipe
2.0-in. Sch. 40
24-in. length
PVC Riser
1.0-in. Sch. 40
5-ft. lengths
High Solids Bentonite Slurry
or Neat Cement Grout
Bentonite Well Seal
Thickness: ≥ 2 feet
Grout Barrier
(20/40 Sand or Collapsed
Natural Formation)
Thickness: ≥ 2 feet above top
of screens
1.0-in. x 2.5-in. OD
Prepack Well Screen
PVC Bottom Plug
Expendable Point,
3.0-in. OD

APPENDIX B:

GRUMMAN EXPLORATION INC., GEOPHYSICAL SURVEY REPORT

Grumman Exploration, Inc.
2309 Dorset Road
Columbus, Ohio 43221
(614) 488-7860 tel; (614) 488-8945 fax

Non-destructive Subsurface Exploration
Near-surface Geophysics

November 6, 2012

Anthony Schulte
Mannik & Smith Group, Inc.
23225 Mercantile Road
Beachwood, Ohio 44122

RE: Report of Geophysical Survey at the Undeveloped Multi-parcel Property Located at the Southwest Corner of E. 55th Street and Woodland Avenue in Cleveland, Ohio – GEI Project No. 01-32083

Dear Tony:

Grumman Exploration, Inc. has completed the geophysical surveys and data analysis for the above referenced project. This letter report provides a description of the method used, field procedures and a brief summary of the observations of the geophysical survey results for the investigation areas. The EM results show several anomalous strong conductivity and 'metal' (in-phase) responses across the site. Several of the anomalous EM responses may represent underground storage tanks or concentrations of metal debris. Strong conductivity responses in other areas may represent former basements, excavations or regions with highly conductive fill or metallic debris.

Project Overview

According to information provided by Mannik & Smith Group, Inc., is conducting environmental investigations at the above referenced multi-parcel property. Many of the parcels have a long history of commercial activities and hazardous material usage. Historical research has identified at least five gas-service stations, several dry-cleaners, paint shops, metal working shops, print shops, a metal scrap yard and other commercial activities at these parcels. As a result, there is concern that undocumented underground storage tanks (USTs), former buildings, waste fill and other conditions or materials of environmental significance may remain on site. The primary targets of interest include underground storage tanks (USTs), concrete vaults, excavations, waste filled areas, buried structures, piping and debris.

The approximate 4.5-acre investigation area is located at the southwest corner of E. 55th and Woodland Avenue and includes a smaller northwest parcel located at the southwest corner of E. 51st Street and Woodland Avenue. Most of the site is generally open and grassy with some exposed soil, fill and former foundations. The ground surface along the Woodland Avenue frontage and in the far southeast corner is uneven and former foundations and basements are visible in these regions. Obstructions and complications at the site included two parked truck trailers, the southern site fence, various manhole covers, occasional vehicle traffic and a line of former truck bumpers in the south-central sub-parcel. The west side of the E. 53rd Street was obstructed by a densely overgrown ridge of industrial and debris fill. An overgrown soil pile was located in the western sub-parcel in the northwest property. The area behind the building on the northwest property was covered by debris piles and was considered inaccessible. Figures 1 and 2 illustrate the general site features within the area of investigation.

Geophysical surveys using the GEM-300 EM conductivity profiling instrumentation and targeted ground-penetrating radar (GPR) were used to non-destructively scan the subsurface and locate and map some of the potential filled areas and buried targets of interest where possible and within the limitations of the two survey methods.

Methodology

The GSSI GEM-300 conductivity profiling instrumentation makes two measurements useful for environmental site investigations: (1) soil electrical conductivity (quadrature phase) and (2) a metallic sensitive reading (in-phase). Electrical conductivity is a useful measurement for mapping spatial variations in soil and fill types based on contrasts in electrical conductivity. Popular EM applications include: soil and fill mapping and characterization, underground storage tank (UST) and other metal target exploration, buried structure and utility pipe mapping. Low conductivity (σ) earth materials, such as a sand and gravel ($\sigma \cong$ 2-25 mS/m), can often be distinguished from higher conductivity silts or clays ($\sigma \cong$ 25-80 mS/m). Fill materials such as demolition debris, reinforced concrete fragments, slag, fly ash, refuse and other miscellaneous wastes often exhibit elevated electrical conductivity levels compared to the surrounding native soil. Elevated moisture content or the presence of electrolytic contaminants within the depth of exploration can also enhance a material's conductivity. The in-phase measurement is highly sensitive to buried metallic objects and can be used to locate and map buried reinforced or steel structures, metallic debris, USTs, 55-gallon drums, utility lines and other metallic or highly conductive materials.

The EM instrumentation operates using specially configured transmitting and receiving coils. The subsurface response to EM eddy currents that are induced by the transmitting coil is measured by the receiving coil. The induced EM response provides an estimate of the bulk electrical conductivity of a subsurface region centered below the EM instrument. The GEM-300 allows up to 16 frequency measurements at each survey station. The user selectable frequencies can range from 325 up to 19,975 Hz. The lateral resolution of the EM instrumentation will depend in part on the frequency, survey station and line spacing, target size, depth and the electrical conductivity of the target and surrounding media. Similarly, the depth of exploration depends on the coil orientation, frequency used, target size and host and target electrical properties. Lower frequencies will penetrate deeper into the subsurface and the *skin-depth* is often used as a guide to the actual penetration distance. Although the manufacturer reports exploration depth capabilities on the order of 20 to 25-ft for the GEM-300, most of the signal response appears to be derived from the upper 3-ft to 10-ft of the subsurface. Because the GEM-300 will begin to respond as a conductive target is approached, the contoured EM response often exaggerates the apparent size of such a target. Shallow, near-surface or ground-level metallic objects, such as reinforced concrete pads, often create negative conductivity and in-phase responses.

The GEM-300 and EMP-400 are lightweight and portable and require one field operator. The EM response can be monitored in the field, either numerically or graphically, and recorded electronically. The data are easily downloaded to a PC and both data channels (conductivity and in-phase) can be contoured using a commercially available contouring program. The EMP-400 allows a direct connection to a GPS device which can provide real-time position information to the field measurements. The conductivity readings are reported as relative units in terms of milli-Siemens/meter (mS/m) and the in-phase in parts-per-million (ppm). The conductivity measurements are considered somewhat relative since no actual calibration location was available on site to corroborate these measurements. The in-phase results are also considered relative and only large deviations (positive or negative) should be considered meaningful for interpreting the presence of metal objects. In the absence of nearby conductive buried objects, the in-phase response should be centered around zero.

Limitations to the use of EM arise from a variety of electrical interference sources that can include: ambient electrical noise such as occurs in urban or densely developed areas, thunderstorms and nearby metallic objects at or above the ground surface such as fences, overhead power lines, reinforced concrete pavement, parked cars, metal clad or reinforced concrete structures, buried foundation walls, etc.

Ground-Penetrating Radar (GPR) has been used as a site investigation tool for diverse applications for several decades. Ground-Penetrating Radar (GPR) operates by transmitting and receiving microwave electromagnetic impulses. By moving a broadband, dipole antenna across the ground surface, a two-dimensional cross-section representing the subsurface response can be displayed on the GPR system unit in real-time. GPR is sometimes described as a pulse-echo device, not unlike sonar or an acoustic fish finder. In contrast to these acoustic devices, GPR operates using electromagnetic impulses that are governed by the principles of electromagnetic wave propagation through the subsurface. Transmitted GPR impulses propagate downward through the subsurface, reflect off buried target boundaries and return to the receiver antenna. Contrasts in the electrical properties of a target will cause some of the GPR signal to reflect back toward the ground surface. Interfaces between electrically distinctive materials such as sand and clay, backfill and steel, concrete and soil, and even the water table can be detected using GPR under favorable survey conditions. Popular applications using GPR include locating and mapping buried underground tanks, pipes, waste fill boundaries, and building foundations.

Important limitations to the performance of GPR include difficulty detecting deeply buried and small targets, and penetrating dense or multi-layered reinforced or conductive pavement sections. The most commonly encountered limitation for GPR is the presence of clay, weathered shale or highly conductive industrial fill in the shallow subsurface. Moist clay, silty clay, weathered shale or other electrically conductive fill materials (e.g. slag, foundry sand, cinders, elevated salt and moisture content, etc.) can severely increase GPR signal attenuation, and thus reduce the signal penetration. The presence of any of these conditions may restrict or even preclude the effective penetration of the GPR signal beyond a few feet. The presence of obstructions, rough ground surface or excessive cover material (e.g. snow, fill, mulch, etc.) can prevent the effective use of GPR.

Field Procedures

Grumman Exploration, Inc. conducted EM and GPR surveys at the project site on September 18 & 19, 2012. Local field survey grids were established at the property. The brick wall located at the southeast corner of the property was used as the survey grid origin and the southern fence line was used as the survey grid baseline (Figures 1 and 2). A smaller, sub-grid was used over the far northwest parcel (southwest corner of E. 51st Street and Woodland Avenue). A Trimble GeoXH with Zephyr antenna GPS system was used to record selected field grid positions using the Ohio North State Plane geographic coordinate system. Figures A-1 and A-2 are analogous to Figures 1 and 2 except that the reference grid used on the contour diagrams use the Ohio North State Plane coordinate system.

The EM survey instrumentation consisted of the GSSI GEM-300 multi-frequency electromagnetic profiling system. Vertical dipole quadrature phase (proportional to conductivity) and in-phase (metal sensitive) measurements using a single coil alignment at three frequencies (4,410 Hz[deep], 9,810 Hz [intermediate depth - same as used by the Geonics, Ltd. EM-31 instrumentation], and 15,0303 Hz [shallow]). The north-south aligned transect spacing was 10-ft, although more detailed 5-ft spaced transects were acquired in areas with anomalous EM responses. The EM measurement interval was approximately 2.2.-ft. The measurements were recorded electronically within the EM instrument. A "continuous survey" mode was used. In this survey mode, data are acquired at a fixed time interval while the operator walks along a survey line at a steady pace. Reference marks at measured distance intervals (100-ft) were incorporated into the data during acquisition to "fix" the survey transects to known positions on site. A computer program was used later to adjust the station positions with respect to the local coordinate system used on site. The EM responses were informally observed during acquisition and elevated and anomalous responses, if any, were noted.

Following the survey, the data were downloaded onto a laptop computer and prepared for contouring. The EM data were contoured using a commercially available program (Surfer, Golden Software, Inc.). A generalized site diagram was superimposed on the contoured results to help identify the positions of various EM responses and anomalies. The results for the 4,410 and 15,030 Hz measurements were generally similar to that for 9,810 Hz data and as a result contour diagrams for these two frequencies (highest and lowest) are not presented herein.

GPR scans were performed over targeted locations across the investigation area based on the preliminary results of the EM scans and/or historical information. The GPR system used was a GSSI SIR-3000 in conjunction with a 400 MHz dipole antenna. The first field task involved equipment setup and the completion of several test scans to observe the GPR response and to adjust the data acquisition parameters. A survey wheel was used to acquire distance-based data at the density of approximately 10.0 GPR traces per foot. The time window used was 80 nanoseconds (ns) and band-pass filters were applied to reduce extraneous interference. Preliminary interpretations regarding the possible presence of piping, excavations and anomalous buried structures and objects were made as the GPR data were acquired. The data were recorded electronically on an internal hard disk in the field and later transferred to a desktop PC computer and a computer workstation for subsequent processing, display and analysis.

Analysis and Interpretation

Figures 1 and 2 present the contoured EM conductivity and in-phase results for the investigation area, respectively. Figures 3 and 4 shows selected GPR records from the site. Anomalous strong EM conductivity and in-phase (metal-sensitive) responses were observed throughout the investigation area.

In general, the EM contour diagrams show broad regions of contain highly conductive fill that appears to include scattered metallic structures and debris. The elevated EM conductivity levels observed over large regions at the site are well above the anticipated conductivity response for typical soil and geologic materials for this region of northeast Ohio (e.g. ~1 to 60 mS/m). Note that the electrical conductivity of some fill types may fall within the range for typical earth materials. As a consequence, the observed EM conductivity response may not